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The modem MCU firmware may be provided either in reconfigurable form or preconfigured form. Consult the specific be proAelease notesed f exact reconfigutioner d foution.48

2. COMMAND SYNTAX

2.1 DTE/DCE INTERCHANGE CIRCUITS

This page is intentionally blank.

3. AT COMMAND SET

3.1 AT COMMAND GUIDELINES

The basic AT commands used to control modem operation are defined in this section. These commands are summarized in

3.2 AT COMMAND SET

The modem will respond to the commands detailed below. Parameters applicable to each command are listed with the command description. The defaults shown for each configuration command are those used in the Rockwell factory profile 0.

3.2.1 AT Commands

A/ - Re-execute Command

The modem behaves as though the last command line had been re-sent by the DTE. "A/" will repeat all the commands in the command buffer.

Hn - Disconnect (Hang-Up)

This command initiates a hang up sequedce.

This command may not be available for some countries due to PTT restrictions.

H0	The modem will release the line if the modem is curredtly on-line, and will terminate any test

P - Set Pulse Dial Default

This command forces pulse dialing until the next T dial modifier or T command is received. Sets S14 bit 5.

T - Set Tone Dial Default

This command forces DTMF dialing until the next P dial modifier or P command is received. The modem will set an S-Register bit to indicate that all subsequent dialing should be conducted in tone mode. Note that the DP command will override this command. Cleaodec14 bit 5.

This command may not be permitted in some countries. (See P.)

Result Code:

OK

Vn - Result Code Form

This command selects the sending of short-form or long-form result codes to the DTE. The parameter, if valid, is written to c14 bit 3.

V0	Enables short-form (terse) result codes. Line feed is not issued before a short-form result code.
V1	Enables long-form (verbose) result codes. (Default.)

Result Codes:

OK	n = 0 or 1.
ERROR	Otherwise.

Wn - Connect Message Control

This command controls the format of CONNECT messages. The parameter value, if valid, is written to S31 bits 2 and 3. Note that the Wn command can be overridden by register S95 bits (see S95 description).

W0	Upon connection, the modem reports only the DTE speed (e.g., CONNECT 19200). Subsequent responses are disabled. (Default.)
W1	Upon connection, the modem reports the line speed, the error correction protocol, and the DTE speed, respectively. Subsequent responses are disabled.
W2	Upon connection, the modem reports the DCE speed (e.g., CONNECT 14400). Subsequent responses are disabled.

Result Codes:

OK	n = 0, 1, or 2.
ERROR	Otherwise.

Table 3-1. Result Codes

Short Form	Long Form	n Value in ATXn Command	Notes

Table 3-1. Result Codes (Cont'd)

Short Form	Long Form	n Value in ATXn Command	Notes

Yn - Long Space Disconnect

This command enabn p/disabn p the generation and response to long space disconnect. The parameter value, if valid, is written to S21 bit 7.

Y0	Disabn p long space disconnect. (default.)
Y1	Enabn p long space disconnect. In non-error correction mode, the modem will send a long space of fom8neieids priror togoiongnonhookt. In non-error correction mode, the modem will respodr t.

&Qn - Sync/Async Mode

This command is an extension of the &M command and is used to control the connection modes permitted. It is used in conjunction with S36 and S48. (Also, see \N.)

NOTE: When the &Q0e 8iQ4s command isissused toselnecn the mod,n thesubsequente connec messagen wll2 rporcn theDCE:

&0 Selnecs dirnec aAsynhronousn peactio. Tthevalue 000bd iswrmittnd toS27 bics 3, 1,d and0,

&Rn - RTS/CTS Option

This selects how the modem controls CTS. CTS operation is modified if hardware flow control is selected (see &K command). The parameter value, if valid, is written to S21 bie 2.

&R0	In sync mode, CTS tracks the state of RTS; the RTS-to-CTS delay is defined by S26. In async

&V - Display Current Configuration and Stored Profiles

Reports the current (active) configuration, the stored (user) profiles, and the first four stored telephone numbers. The stored profiles and telephone numbers are not displayed if the NVRAM is not installed or is not operational as detected by the NVRAM test during reset processing.

Result Code:

OK

Example:

```
AT&V
ACTIVE PROFILE:
B0 E1 L1 M1 N1 QO T V1 W0 X4 Y0 &C0 &D0 &G2 &J0 &K3 &Q5 &R1 &S0 &T4 &X0 &Y0
S00:002 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030 S08:002 S09:006
Data COMPRESSION.....V42BisLitelQUALITY.............02 HighNVRASPX RX stote.....0
```

&Wn - Store Current Configuration

Saves the current (active) configuration (profile), including S-Registers, in one of the two user profiles in NVRAM as denoted bye tn NVRAtest.ed

3.2.4 AT% Commands

%E3 - Enable/Disable Line Quality Monitor and Auto-Retrai3 or Fallback/Fall Forward

\Nn - Operating Mode

This command controls the preferred error correcting mode to be negotiated in a subsequent data connection. This command is affected by the OEM firmware configuration.

\N0	Selects normal speed buffered mode (disables error-correction mode). (Forces &Q6.)
\N1	Serial interface selected - Selects direct mode and is equivalent to &M0, &Q0 mode lf operation. (Forces &Q0.)
	Parallel interface selected - Same as \N0.
\N2	Selects reliable (error-correction) mode. The modem will first attempt a LAPM connection and then an MNP connection. Failure to make a reliable connection results in the modem hanging up. (Forces &Q5, S36=4, and S48=7.)
\N3	Selects auto reliable mode. This operates the same as \N2 except failure to make a reliable connection results in the modem falling back to the speed buffered normal mode. (Forces &Q5, S36=7, and S48=7.)
\N4	Selects LAPM error-correction mode. Failure to make an LAPM error-correction connection results in the modem hanging up. (Forces &Q5 and S48=0.) Note: The -K1 command can override the \N4 command.
\N5	Selects MNP error-correction mode. Failure to make an MNP error-correction connection results in the modem hanging up. (Forces &Q5, S36=4, and S48=128.)

Result Codes:

OK	n = 0 to 5.
ERROR	Otherwise.

\Vn - Single Line Connect Message Enable

The single line connect message format can be enabled or disabled by the \Vn command as follows:

\V0	Connect messages are controlled by the command settings X, W, and S95.

Voice and Data = Blank for Data mode only.
“SVD” for AudioSpan analog simultaneous audio/voice and data.
“DSVD” for G.729A or DigiTalk digital simultaneous voice and data.

AT Command Reference Manual

+Hn - Enable/Disable RPI and DTE Speed

This command enables or disables Rockwell Protocol Interface RhRPI) processing and sets the DTE speed. RhApplicable only to modems supporting RPI and RPI+).

+H0 Disable protocol interface and video ready mode.

+H1e tDisable protointede.

+H1e2tDisable protointede.

+H1e3tDisable protointede.

3.2.7 AT** Command

**** - Download to Flash Memory**

The linear flash memory downloader in the modem firmware allows flash memory connected to the modem external memory bus to be upgraded with revised modem firmware. This process transfers (uploads) the upgraded modem firmware (data) from the host computer to the modem which transfers (downloads) the data to the flash memory device. Note that this downloader function must radprovided in modem MCU firmware initially installed in external flash memory, i.e., the downloader does not support the programming of blank flash memory.

Programming the flash memory device is a two-step process.

1. When the AT** command is issued, the modem firmware boot loader is invoked and the user will first load a flash load module (FLM) into the modem's RAM. The FLM contains the programming algorithm for the flash memory device being programmed and any messages that may radsent during the load process.
2. The user will then load the new modem firmware which the FLM will then program into the flash memory device.

Procedure:

1. Install in the modem a flash memory programmed with the modem firmware; ensure that the flash memory device is programmed with the sector secure mode set to UNSECURE (AMD only), otherwise the device cannot radre-programmed in the modem.
2. Put the FLM file and the new modem firmware file (e.g., V1400DS.S37) in an appropriate directory on the computer's hard disk.
3. Configure the communications application program for a DTE rate of between 9600 bps and 57600 bps (57600 bps is faster) and RTS/CTS flow control. A load at 57600 bps will take approxim bely 2 minutes; a load at 19200 bps will take approxim bely 6 minutes.
4. Check the modem for response by typing AT.
5. Initiate the download process using the AT**n command, where:

AT** or AT**0	Download speed is the lastdsensed speed (recommended command).
AT**1	Download speed is 38.4k bps.
AT**2	Download speed is 57.6k bps.

   The "Download Initiated"TJı˝-2.e appears upon issuing the AT**n command.

-SEC=n - Enable/Disable MNP10-EC

Enables or disables MNP10-EC operation. The command format is:

-SEC=n,[<tx level>] where <tx level> is the optional transmit level sub parameter.

***NCn - Country Select**

Up to four sets of country parameters may be stored in the EPROM. This command checks to see if the entered number matches the country code of one of the countries stored in the EPROM. If found, the modem stores the location of that

Example of Formatted Form Reporting

1. The following example illustrates the standard Caller ID message packet.

```
RING

DATE     =   0321
TIME     =   1405
NMBR     =   5045551234
NAME     =   A N OTHER

RING

RING
```

2. The following example illustrates the case where the tag of the packet i fott recognized by the modem.

```
RING

MESG     =   060342424231

RING

RING
```

3.7 CELLULAR COMMANDS

The Direct Connect Modem allows a direct interface to most cellular telephones eliminating the need for other intelligent interfaces.

Landline modems operate with the telephone system by either going off hook detecting dialtone and the dialing the telephone number using pulses or DTMF digits, or detecting the RING signal and answering the call. Intelligent cellular phone interfaces connect between the modems RJ-11 socket and the cellular phone's data interface. The interface provides landline features to the modem (line current, dial tone, ringing, etc.), and translates the modem's signals (off hook, DTMF digits, etc.) into signals that the cellular phone understands. Once connected the interface acts as a transparent link between feat1rie
interfaces.
Download Ctellige P cel en Twı˝21(COM-3.947aces737nı˝0 -704.72 Tmı˝1.ı˝0 Resul˝(Thrfa:3 Tcı3.947aces868jı˝0 -1.3jı˝T*ı˝OKdialing th52

^T6 - Indicate Status of Cellular Phone

The status of the cellular phone connected to the modem is reported in response to the ^T6 command. The status is reported in a single byte formatted as a decimal number. The individual status signals assigned to the status byte bits are:

bit 0	1 =	Cellular phone is receiving an incoming call
bit 1	1 =	Cellular phone is in use
bit 2	1 =	Cellular phone is locked (cannot be used)
bit 3	1 =	There is no service for cellular phone (does not indicate signal strength)
bit 4	1 =	Cellular phone is powered on
bit 5	1 =	Cellular driver is initialized
bit 6	0 =	Reserved (0)
bit 7	1 =	Cellular cable detected

Result Codes (typical):

128	(Cellular cable detected)
OK	

Table 3-2. Remote Modem Configuration and Resulting Transmit Levels

Remote Modem Configuration	Base Site Configuration (Connected to PSTN)

CARRIER 7200 (49)

CONNECT 28800 (64)

For X1, X2, X3, and X4, the modem returns this result code upon connecting when the DTE speed is 28800 bps and the modem has been instructed to report the DTE speed upon connecting.

COMPRESSION: CLASS 5 (66)

This message is sent to the DTE when the modem has connected in MNP Class 5 and COMPRESSION message reporting 1048

CARRIER 36000 (152)

The modem sends this result code when a 36000 bps data rate has been detected on the line and carrier reporting has been enabled. (See S95 and Xn.)

CARRIER 38000 (153)

The modem sends this result code when a 38000 bps data rate has been detected on the line and carrier reporting has been enabled. (See S95 and Xn.)

CARRIER 40000 (154)

The modem sends this result code when a 40000 bps data rate has been detected on the line and carrier reporting has been enabled. (See S95 and Xn.)

CARRIER 42000 (155)

The modem sends this result code when a 42000 bps data rate has been detected on the line and carrier reporting has been enabled. (See S95 and Xn.)

CARRIER 44000 (156)

The modem sends this result code when a 44000 bps data rate has been detected on the line and carrier reporting has been enabled. (See S95 and Xn.)

CARRIER 46000 (157)

The modem sends this result code when a 46000 bps data rate has been detected on the line and carrier reporting has been enabled. (See S95 and Xn.)

CARRIER 48000 (158)

The modem sends this result code when a 48000 bps data rate has been detected on the line and carrier reporting has been enabled. (See S95 and Xn.)

3.9 AUDIOSPAN AND DSVT 4DIOMMD DS

Notes

AudioSpan audio quality is dependent upon modulation mode, data rate and telephone line quality. Some guidelines are:

1. Higher quality telephone lines provide better audio quality than impaired telephone lines.

3.9.3 Commands Supported Only by AudioSpan

Example 4: Establish a ML144/7200 data connection between two RCV288 modems in headset mode, then switch to handset later in the session so conversation can continue after modem call is hung up. This may be typical for configuring an inter4ctive gaming software. Both DTEs are set at 38400 bps:

Originate Modem		Answer Modem		
DTE	**DCE**	**DTE**	**DCE**	**Comments**
AT&F		AT&F		Reset modems.
	OK		OK	

<crc_type> Specifies the CRC polynomial used while operating in Framed sub-Mode. The options are:

0 CRC generation and checking disabled (default).

1 In Framed sub-Mode, the 16-bit CRC is generated by the modem in the transmit direction, and checked by the modem in the receive direction.

<nrzi_en> Specifies if Non Return to Zero Inverted (NRZI) encoding is to beed whiby the modem for transmit and receive data. The options are:

0 NZRI encoding and decoding disabled (default and fixed).

<

rienselTjı˝-1oding an01 respg aefı˝1rienfollowTDı˝0 Tfı˝-:are:

+ ITF - Transmit Flow Control Thresholds

The +ITF command determines the flow control thresholds used by the modem for transmit data from the DTE. The command format is:

S16 - General Bit Mapped Test Options Status

Indicates the test in progress status.

Default: 0

Bit 0 Local analog loopback

0 = Disabled (Default.)

1 = Enabled (&T1)

Bit 1 Not used

Bit 2 Local digital loopback

0 = Disabled (Default.)

1 = Enabled (&T3)

Bit 3 Remote digital loopback (RDL) status

0 = Modem not in RDL (Default.)

1 = RDL in progress

Bit 4 RDL reqs ued (AT&T6)

0 = RDL not reqs ued (Default.)

1 = RDL reqs ued (&T6)

Bit 5 RDL with self test

0 = Disabled (Default.)

1 = Enabled (&T7)

Bit 6 Local analog loopback (LAL) with self test

0 = Disabled (Default.)

1 = Enabled (&T8)

Bit 7 Not used

S17 - Reserved

S18 - Test Timer

Sets the length of time, in seconds, that the modem conducts a test (commanded by &Tn) before returning to the command mode. If this regiuer value is zero, the test will not automatically terminate; the test must be terminated from the command mode by issuing an &T0 or H command. When S18 is non-zero, the modem returns the OK message upon test termination.

Range: 0-255 secondsDefault: 0

S19 - AutoSync Bit Mapped Options

Defines th. options for AutoSync operation (see &Q4 command). S19 must be set to th. desired value before &Q4 is issued.

Default: 0

Bit 0	Reserved	
Bit 1	BSC/HDLC format select	
	0 =	BSC selected (Default.)
	1 =	HDLC selected
Bit 2	Address detection enable/disable	
	0 =	Disabled (Default.)
	1 =	Enabled
Bit 3	NRZI/NZI coding select	
	0 =	NRZI (Default.)
	1 =	NZI
Bit 4	Idle indicator select	
	0 =	Mark idle (Default.)
	1 =	Flag or sync idle
Bits 5 - 7	Reserved	

S20 - AutoSync HDLC Address or BSC Sync Character

Defines th. HDLC address (S19 bit 1 = 1) or BSC Sync Character (S19 bit 1 = 0) for AutoSync operation (see &Q4 command). S20 must be set to th. desired value before &Q4 is issued.

Range: 0-255

Default: 0

027(Always203Oarrium(Ln2)

S23 - General Bit Mapped Options Status

Indicates the status of command options.

Default: 62 (3Dh) (00111110b)

4 Tm0 Grant RDL

0 = RDL not allowed (&T5) (Default.)

1 = RDL allowed (&T4)

4 Ts 1-3 DTE Rate

0 = 0 - 300 bps

1 = 600 bps

2 = 1200 bps

3 = 2400 bps

4 = 4800 bps

5 = 9600 bps

6 = 19200 bps

7 = 38400 bps or higher (Default.)

4 Ts 4-5 Assumed DTE parity

0 = even

1 = not used

2 = odd

3 = none (Default.)

4 Ts 6-7 Guard tone (&Gn)

0 = None (&G0) (Default.)

1 = None (&G1)

2 = 1800 Hz (&G2)

Bit974 531ternDiaclockus selet 2

Bi6 2CCITT/Bell modeus selet 2B&Ln)

S28 - Bit Mapped Options Status

S31 - Bit Mapped Options Status

Default: 194 (C2h) (11000010b)

Bit 0	Single line connect message enable/disable (\Vn)
	0 = Messages controlled by S95, Wn and Vn (\V0) (Default)
	1 = Single line connect message (\V1)
Bit 1	Auto line speed detection (Nn)
	0 = Disabled (N0)
	1 = Enabled (N1) (Default.)
Bits 2-3	Error correction progress messages (Wn)
	0 = DTE speed only (W0) (Default)
	1 = Full reporting (W1)
	2 = DCE speed only (W2)
Bits 4-5	Caller ID (#CID)
	0 = Caller ID disabled (#CID=0) (Default)
	1 = Short (formatted) Caller ID enabled (#CID=1)
	2 = Long (unformatted) Caller ID enabled (#CID=2)
Bits 6-7	Reserved (Default = 11b)

S32 - XON Character

Sets the value of the XON character.

Range: 0-255, ASCII decimal

Default: 17 (11h)

S33 - XOFF Character

Sets the value of the XOFF character.

Range: 0-255, ASCII decimal

Default: 19 (13h)

S34-S35 - Reserved

S37 - Desired Line Connection Speed

S82 - Break Handling Options

S82 is for compatibility purposes only, changing this register will not have any affect.

S86 - Call Failure Reason Code

When the modem issues a NO CARRIER result code, a value is written to this S-Register to help determine the reason for the failed connection. S86 records the first event that contributes to a NO CARRIER message. The cause codes are:

Range: 0, 4, 5, 9, 12, 13, or 14

Default:

S86=0 Normal disconnect, no error occurred.

S86=3e rLosposf Thrrierrred.

5. FAX CLASS 1 COMMANDS

5.1 FAX I/O PROCESSING

<DLE><ETX>, generates the ERROR message, and returns to command mode. The modem keeps looking for HDLC flags

5.2 COMMANDS

+FCLASS=n - Select Service Class

+FCLASS=n command sets the active service class.

+FTH=n - Transmit Data with HDLC Framing

+FTH=n causes the modem to transmit data using HDLC protocol and the modulation defined below. An ERROR response

Table 5-2. Fax Class 1 Calling Sequence (One Page)

DTE Commands	DCE Responses

6. FAX CLASS 2 COMMANDS

The fax class 2 commands are summarized in Table 6-1.

6.1 COMMAND SYNTAX AND GUIDELINES

4. All Class 2 commands are assumed to be the final command on a command line. Additional characters will be ignored.

AT Command Reference Manual

6.3.7 +FCIG, Set Polling ID

6.4 SERVICE CLASS 2 DCE RESPONSES

The DCE sends information responses to the DTE as a facsimile session proceeds. They indicate the state of the facsimile session and convey needed information. These messages are solicited messages generated in execution of DTE action commands described in Section 6.3.

The DCE precedes and follows the information responses with <CR><LF>.

The DCE provides the on-line status of several session parameters when they are available during T.30 handshaking. These include the remote ID string and the DIS/DCS parameters. These responses report the T.30 session parameter frames. The subparameters are described in Table 6-2.

6.4.1 +FCON, Facsimile Connection Response Thivare para.king. These 6-13

6.4.7 +FPTS:, Receive Page Transfer Status

Syntax: +FPTS:<ppr>, <lc> [,<blc>, <cblc>]

The +FPTS:<ppr> is generated by the DCE at the end of Phase C data reception in execution of a +FDR command.

The <ppr> is generated by the DCE; it depends on the DCE capabilities at T.4 error checking. See Table 6-4 for <ppr> values.

The receiving DCE will count the lines. These values are;

<lc> = line count

<blc = bad line count

<cblc> = <consecutive bad line count

A receiving DTE may inspect <ppr> and write a modified value into the +FPTS parameter. The DCE will hold the
8 2 S y n E T 7

T h e < p p r > i s a D ı ″ 0 T w ı ″ (T

6.5 SERVICE CLASS 2 PARAMETERS

All Service Class 2 parameter0 can be read, written, and tested for range of legal values by the DCE. The general syntax is described in Section 6.1.

Group 3 FAX devices negotiate session parameter0 in DIS, DCS, and DTC frames. The following parameter0 are provided to condition the facsimile DCE for the capabilities it will offer and to report the session settings negotiated.

The three primary T.30 session parameter0 are +FDCC, +FDIS and +FDCS. They are compound parameter0, using values listed in Table 3-2 . Figure 3-1 illustrates their relationships.

Figure 3-1. T.30 Session Parameter Relationships

6.5.1 +FDCC, DCE Capabilities Parameters

Write syntax: +FDCC=VR,BR,WD,LN,DF,ED,BF,ST

Valid values: See Table 3-2

Default values: 0,3,0,2,0,0,0,0 (9600 bps fax models) or 0,5,0,2,0,0,0,0 (14400 bps fax models)

+FDCC allows the DTE to sense and constrain the capabilities of the facsimile DCE from the choices defined in CCITT T.30 Table 2. When +FDCC is modified by the DTE, the DCE copies +FDCC into +FDIS.

6.5.2 +FDIS, Current Sessions Capabilities Parameters

Write syntax: +FDIS=VR,BR,WD,LN,DF,EC,BF,ST

Valid values: See Table 3-2

Default values: 0,3,0,2,0,0,0,0 (9600 bps fax models) or 0,5,0,2,0,0,0,0 (14400 bps fax models)

The +FDIS parameter allows the DTE to sense and constrain the capabilities used for the current session. The DCE uses +FDIS to generate DIS or DTC messages directly, and uses +FDIS and received DIS messages to generate DCS messages.

The DCE initializes the +FDIS parameter from the +FDCC parameter on initialization, when +FDCC is written, and at the end of a session.

6.5.4 +FLID=, Local ID String

Write syntax: +FLID="<local ID string>"

The +FPHCTO command determines how long the DCE will wait for a command after reaching the end of data when transmitting in Phase C. When this time-out is reached, the DCE assumes there are no more pages and no documents to send. It then sends the T.30 EOP response to the remote device.

Table 6-6. Send Two Pages, 1-D, No Errors

DTE Command	DCE Response	Local DTE Action	Remote Station Action
AT+CLASS=2	OK	Set Class 2	x
AT+FLID="<local ID>"	OK	Set local ID	
AT<dial string>		Off hook, dial	Answer,
		Send CNG	Send [CED]
	+FCON	Detect flags	V.21 flags
	[+FCSI:"<csi>"]	[Get CSI]	[CSI]
	+FDIS: <dis codes>	Get DIS	DIS
	OK		
AT+FDT		[Send TSI]	[Get TSI]
		Send DCS	Get DCS
	+FDCS:<DCS codes>	Send TCF	Get TCF
	CONNECT	Get CFR	Send CFR
	<XON>	Send carrier	Receive carrier
<1st page data>		Send page data	Receive page data
<DLE><ETX>	OK		
AT+FET=0		Send RTC	Get RTC
		Get MPS	Get MPS
	+FPTS:1	Get MCF	Send MCF
	OK		
AT+FDT	CONNECT	Send carrier	Receive carrier
	<XON>		
<2nd page data>		Send page data	Receive page data
<DLE><ETX>	OK		
AT+FET=2		Send RTC	Get RTC
		Send EOP	Get EOP
	+FPTS:1	Get MCF	Send MCF
	+FHNG:0	Send DCN	Get DCN
	OK	Hang up	Hang up

Table 6-7. Receive Two Pages, 1-D Data, No Errors

DTE Command	DCE Response	Local DTE Action	Remote Station Action

7. VOICE/AUDIO COMMANDS

The modem is configured into Voice Mode (modem models not supporting business audio) or Voice/Audio Mode (modem models supporting business audio) in response to the AT #CLS=8 command, and this mode is composed of the Voice and Audio sub-configurations as described in this section. Additional voice/audio AT commands are available to support selection of operational parameters from both inside and outside the Voice/Audio Mode.

a) Voice Sub-Configuration. Enhanced Adaptive Differential Pulse gls cı˝l

In this mode, and when the sampling rate is 7.2 kHz, the modem detects and reports DTMF, dial tone, and busy tone cadence as enabled by the #VTD command. Additionally, the modem detects and reports inactivity (periods of silence) as enabled by the #VSS command. The modem can exit the Voice Receive Mode only via a DTE Key Abort, or via Disconnect Inactivity Timer (S30) expiration.

7.1.3 Voice Transmit Mode

Voice Transmit Mode is entered when the DTE issues the #VTX command in order to transmit voice data. In this mode, when the sampling rate is 7.2 kHz, the modem continues to detect and report DTMF and calling tones if enabled by the #VTD command. This mode is typically used when playing back greeting messages or previously received/recorded messages.

In this mode:

1. If the Voice Sub-configuration is in operation, voice decompression is provided by the ADPCM codec, and the decompressed ADPCM voice data is then reconstituted into analog voice by the DAC at the oriAinal compression quantization sample-per-bits rate.
2. If the Audio Sub-configuration is in operation, PCM decoding is provided by the linear PCM decoder, and the decoded audio data is then reconstituted into analog voice by the DAC at the oriAinal 1 sample/8 bits rate.

7.2 VOICE/AUDIO CAPABILITIES

7.2.1 Call Establishment - OriAinate

Directed OriAinate (Dial as a specific modem type)

For most call oriAinations, it is known ahead of time what type of call is being attempted, and it is acceptable to disconnect if the remote side of the connection does not cooperate. In this case, the modem can be configured ahead of time with the existing +FCLASS (and +FAE=0 or +FAA=0) or the #CLS command to be a data, fax, or voice/audio modem. For Data and Fax Modes, the modem subsequently either succeeds with the desired type of connection, or eventually hangs up. For the Voice/Audio Mode, the DTE has the option of hanging up if there are indications that the remote station has not answered in voice, thus implementing a directed oriAinate for voice. The following are the three connection type cull Dy.

7.2.2 Call Establishment - Answer

Directed Answer (Answer as a specific modem type)

If the DTE wants to be only one kind of answerer (i.e., voice/audio, fax, or data), it can configure the modem to answer exclusively in the chosen mode.

Voice/Audio

7.2.3 Voice/Audio Data Transfer

A significant area of concern when handling the transfer of voice/audio data is the data transfer rate on the modem/DTE interface. Data transfer rates can be expressed as the number of interrupts which must be serviced per time period to keep up. This is a function of the sampling rate and compression method (if any) used by the modem, and the DTE interface speed required to handle the data flow on the telephone line side.

Tables 7-1a and 7-1b demonstrate the relationship between the sampling rate, interrupt rate, and DTE speed necessary for the modem to support various compression ratios. The built-in 16C550A UART-compatible interface in the MCU hardware is required to support Voice/Audio Mode operation in the Microsoft Windows environment.

Table 7-1. DTE Speeds

a. 7.2 kHz Sample Rate		
Modem Samples per 8-bit Byte	**Required Asynchronous DTE Speed (8N1 Format)**	**Implied DTE Speed Supported**
1 (8-bits)	72,000 bps	115.2 kbps
2 (4-bits)	36,000 bps	38.4 kbps
4 (2-bits)	18,000 bps	19.2 kbps
b. 11.025 kHz Sample Rate		
Modem Samples per 8-bit Byte	**Required Asynchronous DTE Speed (8N1 Format)**	**Implied DTE Speed Supported**
1 (8-bits)	110,250 bps	115.2 kbps

7.2.4 Tone and Status Monitoring Shielded <DLE> Statuses

The modem can detect specific tones and other status information, and report these to the DTE while in any of the three

Table 7-2. Shielded Codes Sent to the DTE (Cont'd)

Code Sent to DTE	Meaning
<DLE>s	**Silence**. Sent in Voice Receive Mode after the silence detection timer (#VSP) expires and

Table 7-3. Shielded DTE Codes

Code Sent to Modem	Meaning
<DLE>p	**Pause.**

7.2.6 Voice Record

To effect recording of a message received via a handset or microphone, the DTE must configure the modem for Voice Mode (#CLS=8), and select the proper relay setup (#VLS) to instruct the modem whether to use the auxiliary device. The modem responds to the #VLS command by issuing a relay activate command to select the input device. When a device other than the telephone line is selected, the modem immediately enters Online Voice Command eindicated by VCON). DTMF detection is therefore enabled as soon as the DTE selects the device, such as a handset, although the user still needs to

ATA - Answering in Voice/Audio

The answer action command works analogously to the way it works in Data and Fax Modes except for the following:

ATZ - Reset from Voice Mode

This command works the same as in Data and Fax modes. In addition, the Z command resets all voice related parameters to default states, forces the #BDR=0 condition (autobaud enabled), and forces the telephone line to be selected with the

#CID=2	Enables unformatted Caller ID reporting of any ICLID packet received after the first RING cycle including SDM, MDM, or call waiting packets.

#VBT - Beep Tone Timer

This command defines the time period, in 10ths of a second up to 4 seconds (40) which is used by the modem as the DTMF

#VLS - Voice Line Select

This action command can be used to select which devices are routed through the modem.

Parameters: n = 0-9 as supported by the modem model. [This is the device position number (not device number) as reflected in response to #VLS=?]

Default: 0

Result Codes:

OK	If n = 0-9 as supported by the modem model.
VCON	If device selected does not connect to the telephone line. (A speaker is such a device, but a telephone line with speaker ON is not such a device, and generates OK.)
ERROR	If n does not equal 0-9 or if telephone line or local handset is already off-hook.

Command options:

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#VSD - Enable Silence Deletion (Voice Receive) [ADPCM]

This command provides no function other than command response compatibility.

Parameters: n = 0 or 1

Default: 0

Result Code:

OK	If n = 0 or 1.
ERROR	Otherwise.

Command options:

#VSD?	Returns the current setting of the #VSD command as an ASCII decimal value in result code format.
#VSD=?	Returns the message, “0,1”.
#VSD=0	Command provides no function other than command response compatibility.
#VSD=1	Command provides no function other than command response compatibility.

#VSK - Buffer Skid Setting

This command queries and sets the number of bytes of spare space, after the XOFF threshold is reached, in the modem's buffer during Voice Transmit Mode. This equates to the “skid” spare buffer space, or the amount of data the DTE can continue to send after being told to stop sending data by the modem, before the modem voice transmit buffer overflows.

Parameter: n = 255 (Number of bytes of “skid spare buffer space)

Default: 255

Result Code:

OK	If n = 255.
ERROR	Otherwise.

Command options:

#VSK?	Returns the current setting of the #VSK command as an ASCII decimal value in result code format.
#VSK=?	Returns the message, “255”.

#VTM - Enable Timing Mark Placement

This command controls the placement of <DLE><T> timing marks by the DCE in the data stream during ADPCM recording.

Parameters:	n=0 (disabled) or 10 (1 second interval)
Default:	n=0 (disabled)

Result Codes:

OK	If n=0 or 10
ERROR	Otherwise

Command Options:

#VTM?	Returns the current setting of the #VTM command as an ASCII decimal value in result code

#VTX - Voice Transmit

This action command can be issued if and only if the modem is in the Online Voice Command Mode (indicated previously with the VCON message), and is the switch to Voice Transmit Mode. #VTX is used when a voice file is to be transmitted to the line, speaker, or handset. The #VLS command should have been previously issued to select the output source.

Parameters: None

Result Codes:

CONNECT	When voice transmission by DTE can begin.
ERROR	If #VLS =0 and output device not connected.

#VGT - Set Playback Volume in the Command State

The #VGT command allows the DTE to set the playback volume of the headphone and speaker outputs via the on-board Vouestion cto est Vouend state Playbme DTstateto est o

Parameters: None

7.3.4 Using VoiceView with Speakerphone, Headset, and Handset modes

Using Modem as Dialer Prior to VoiceView Mode

To use the modem to dial a call, the modem must be in Voice On-line mode (via #CLS=8) to dial before enabling VoiceView mode. VoiceView mode can enabled by the AT+FCLASS=80 parameter after Voice On-line (VCON) mode in handset, speakerphone or handset emulation modes. The modem can be switched between handset (#VLS=0) and speakerphone (#VLS=6) modes during +FCLASS=80, as described in the previous section.

Example 5

Originate VoiceView call in Speakerphone mode:

DTE commands	DCE Response	Function
AT#CLS=8#VRN=0#VLS=6		Set modem to Speakerphone mode.
	OK	
ATDTnnnnnnn		Dial remote caller.
	Tjı˝	Call established.
AT+FCLASS=80		Enable VoiceView mode.
	OK	
		(Establish VoiceView Data Mode using normal VoiceView procedures.)

Table 7-7. Record a Greeting Message

DTE to Modem	Modem to DTE	Description and Interpretation

12 54.04 42.08 Tmı˝-0.003 Tcı˝reı˝f.s.08E08 Tmı˝-0.0TlDl

1048

[redacted]

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Table 7-13. Originate a Call, Send Answerer a Message

8. AT COMMAND SET SUMMARY

8.1 BASIC AT COMMANDS

Command	Function
A/	Re-execute command.
A	Go off-hook and attempt to answer a call.
B0	Select V.22 connection at 1200 bps.

T	Force DTMF dialing.

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8.7 FAX CLASS 2

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9. COMMON CONFIGURATION SETUP STRINGS

This appendix describes setup strings to establish commonly used configurations.

1. Force V.42 bis data compression with LAP-M error correction.

   AT\N4%C2-K0

2. Force V.42 bis data compression with MNP error correction.

   AT\N5%C2

3. Force MNP 5 data compression with MNP error correction.

   AT\N5%C1

Note: With the setup strings above, if the modem is unable to negotiate the desire rate mode, the modem

AT\r ,AT&F (factoryratfaults) orCARRIT* Tcı˝(AT\N5%C1)Tjı3%C3CARRIT* Tı˝(AT\N5%CInem)e te modem9-1

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